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# Chronic Myeloid Leukemia Causes, Risk Factors, and Prevention

Learn about the risk factors for chronic myeloid leukemia and if there are things you might be able to do to help lower your risk.

## Risk Factors

A risk factor is anything that affects your chance of getting a disease such as cancer. Learn more about the risk factors for chronic myeloid leukemia.

- [Risk Factors for Chronic Myeloid Leukemia](#)
- [What Causes Chronic Myeloid Leukemia?](#)

## Prevention

There's no known way to prevent most cases of chronic myeloid leukemia. Some kinds of cancer can be prevented by making lifestyle changes and avoiding certain risk factors, but this isn't true for most cases of CML. The only potentially avoidable risk factor for CML is exposure to high doses of radiation, which applies to very few people.

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# Risk Factors for Chronic Myeloid Leukemia

A risk factor is something that affects a person's chance of getting a disease such as

cancer. For example, exposing skin to strong sunlight is a risk factor for skin cancer. Smoking is a risk factor for a number of cancers. But having a risk factor, or even many risk factors, does not mean that you will get the disease. And many people who get the disease may not have had any known risk factors.

The only risk factors for chronic myeloid leukemia (CML) are:

- **Radiation exposure:** Being exposed to high-dose radiation (such as being a survivor of an atomic bomb blast or nuclear reactor accident) increases the risk of getting CML
- **Age:** The risk of getting CML goes up with age
- **Sex:** In general, leukemia is more common in men than women. This includes CML that is slightly more common in males than in females. The reason for this is not clear.

There are no other proven risk factors for CML. The risk of getting CML does not seem to be affected by smoking, diet, exposure to chemicals, or infections. And CML does not run in families.

## Hyperlinks

1. [www.cancer.org/cancer/types/chronic-myeloid-leukemia/references.html](http://www.cancer.org/cancer/types/chronic-myeloid-leukemia/references.html)

## References

### [See all references for Chronic Myeloid Leukemia](#)

American Society of Clinical Oncology. Leukemia - Chronic Myeloid - CML: Treatment Options. 11/2016. Accessed at [www.cancer.net/cancer-types/leukemia-chronic-myeloid-cml/introduction](http://www.cancer.net/cancer-types/leukemia-chronic-myeloid-cml/introduction) on May 14, 2018.

National Cancer Institute. Chronic Myelogenous Leukemia Treatment (PDQ)-Patient Version. March 30, 2018. Accessed at [www.cancer.gov/types/leukemia/patient/cml-treatment-pdq](http://www.cancer.gov/types/leukemia/patient/cml-treatment-pdq) on May 14, 2018.

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## What Causes Chronic Myeloid Leukemia?

Normal human cells grow and function based mainly on the information contained in each cell's chromosomes. Chromosomes are long molecules of DNA in each cell. DNA is the chemical that carries our genes, the instructions for how our cells function. We look like our parents because they are the source of our DNA. But our genes affect more than the way we look.

Each time a cell prepares to divide into 2 new cells, it must make a new copy of the DNA in its chromosomes. This process is not perfect, and errors can occur that may affect genes within the DNA.

Some genes control when our cells grow and divide.

- Certain genes that promote cell growth and division are called **oncogenes**.
- Others that slow down cell division or cause cells to die at the right time are called **tumor suppressor genes**.

Cancers can be caused by changes in DNA (mutations) that turn on oncogenes or turn off tumor suppressor genes.

Over the past few years, scientists have made great progress in understanding how certain changes in DNA can cause normal bone marrow cells to become leukemia cells. In no cancer is this better understood than in chronic myeloid leukemia (CML).

Each human cell contains 23 pairs of chromosomes. Most cases of CML start during cell division, when DNA is "swapped" between chromosomes 9 and 22. Part of chromosome 9 goes to 22 and part of 22 goes to 9.

This is known as a **translocation** and it makes a chromosome 22 that's shorter than normal. This new abnormal chromosome is called the Philadelphia chromosome. **The Philadelphia chromosome is found in the leukemia cells of almost all patients with CML**

The swapping of DNA between the chromosomes leads to the formation of a new gene

(an oncogene) called *BCR-ABL*. This gene then produces the BCR-ABL protein, which is the type of protein called a **tyrosine kinase**. This protein causes CML cells to grow and divide out of control.

In a very small number of CML patients, the leukemia cells have the *BCR-ABL* oncogene but not the Philadelphia chromosome. It's thought that the *BCR-ABL* gene must form in a different way in these people. In an even smaller number of people who seem to have CML, neither the Philadelphia chromosome nor the *BCR-ABL* oncogene can be found. They might have other, unknown oncogenes causing their disease and are not considered to truly have CML.

Sometimes people inherit DNA mutations from a parent that greatly increase their risk of getting certain types of cancer. But mutations passed on by parents do not cause CML. DNA changes related to CML occur during the person's lifetime, rather than having been inherited before birth.

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Last Revised: June 19, 2018

# Can Chronic Myeloid Leukemia Be Prevented?

There's no known way to prevent most cases of chronic myeloid leukemia (CML). Some kinds of cancer can be prevented by making lifestyle changes and avoiding certain risk factors, but this is not true for most cases of CML. The only potentially avoidable risk factor for CML is exposure to high doses of radiation, which applies to very few people.

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